

USSR/Chemical Technology - Chemical Products and  
Their Applications -- Electrochemical  
Manufacturing. Electrodeposition.  
Chemical Sources of Electrical Current.

I-9

Abs Jour : Ref Zhur - Khimiya, No 3, 1957, 8903

It is shown that the greatest suppression of E occurs in pure metals; in alloys the concentration polarization is insufficient for the complete suppression of E. In the latter case polishing may not take place in the region of limiting current if the differences between the chemical elements constituting the alloy is sufficiently great. At not-too-high anode potentials (at the onset of the limiting current plateau) some E of the surface must occur but its extent is very small and does not interfere with the production of a polished surface.

Card 2/2

KRICMAR S. J.

Blatt 1. 4526

Differential Capacity of Copper Anodes in Orthophosphoric Acid.  
S. I. Krichmar, L. A. Shamunov, and V. P. Oslushko (Zhur. Fiz. Khim., 1976, 50, (7), 1452-1454). [In Russian]. To explain the existence of a limiting current in the electropolishing of Cu and Cu alloys in  $H_3PO_4$  soln., K. et al. investigated the changes in the differential capacitances of the electrodes with simultaneous plotting of the  $V/i$  graph. Materials investigated were Cu, 5/5 brass, and Al bronze. The potentials were compared with the standard calomel electrode. The capacity/ $i$  curve shows two max., the first at 0.15-0.2 V., due to formation of the hard phase at the anode through the evolution of the reaction products, the second corresponds to the region of discharge of O and may indicate the formation of an oxide film. The max. are smaller at low concentrations of  $H_3PO_4$ , which may explain the absence of electropolishing in weak  $H_3PO_4$  soln. —A. W.

CB

KRICHMAR, S.I.

The luminescence method of determination of oil in industrial ammonium nitrate solution. M. M. Kozlovskaya, S. I. Krichmar, E. A. Kopylova, and M. M. Korotych (Nitrogen Fertilizer Plant, Dneprodzerzhinsk). *Zavodskaya Lab.* 25, 20(1957).—Results by the N. N. Vasilievich luminescence method (*Ibid.* 20, 8(1954)) were compared with gravimetric data. results, and considered satisfactory. W. M. Steinberg

MT

KRICHMAR, S. I.

21  
V. Luminescence method for the determination of small amounts of oil in acid. S. I. Krichmar (Nitrogen Fertilizers Plant, Dneprodzerzhinsk), *Zashchitnye Lab.* 23, 323 (1957).—A luminescence method is described for the detn. of small amts. of oil in dil. HNO<sub>3</sub>. The results with synthetic samples contg. 1-20 mg. oil/l. show (relative) errors of 0 to +50%. W. M. Sternberg

3

JK

KRICHMAR, S.I.

Calculating the smoothening in electrochemical polishing of metals  
(with summary in English). Zhur.fiz.khim.31 no.7:1593-1599 J1 '57.

(MIRA 10:12)

1. Dnepropetrovskiy gosudarstvennyy universitet im. 300-letiya  
vossoyedineniya Ukrainy s Rossiyey.

(Electrolytic polishing)

*Experimental investigation of the smoothening process in electrochemical polishing*  
KRICHMAR, S.I.; GALUSHKO, V.P. (Dneprodzerzhinsk)

Experimental investigation of the smoothening process in electrochemical polishing [with summary in English]. Zhur.fiz.khim.31 no.8:1762-1766 Ag '57. (MIRA 10:12)

(Electrolytic polishing)

76-10-29/34

Krichmar, S. I.

AUTHOR:

Krichmar, S. I.

TITLE:

An Arrangement for Measuring Electroconductivities at Industrial Current Frequencies without the Use of Platinized Electrodes (Ustanovka dlya izmereniya elektroprovodnosti na promyshlennoy chastote bez primeneniya platinirovannykh elektrodov).

PERIODICAL:

Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 10, pp. 2361-2363 (USSR)

ABSTRACT:

For these measurements a relatively simple scheme was worked out and tried. Plain platinum electrodes (in nonaggressive media arbitrary other electrodes can be used) with a feeding of the scheme by a current with an industrial frequency of 50 c are used. In order to increase the accuracy the analysis is thus carried out that Ohm's resistance of the electrolyte "r" exceeds considerably all other current circuit elements what concerns its amount. In the here described device the "s" of the capillary is chosen in dependence on the electroconductivity of the measured liquids of from  $3 \cdot 10^{-2}$  to  $1 \cdot 10^{-3} \text{ cm}^2$  at  $\ell \sim 20-25 \text{ cm}$  and a total surface

CARD 1/3

An Arrangement for Measuring Electroconductivities at Industrial Current Frequencies without the Use of Platinized Electrodes

"APPROVED FOR RELEASE: Monday, July 31, 2000

CIA

300

76-10-29/34

of  $5 \text{ cm}^2$  of the electrodes. The measurements were carried out after the phase shift. The voltage which was shifted at the cost of the capacity "C" and the resistance "R" practically by  $90^\circ$  in the phase was applied at the horizontal amplifier of the oathode oscillograph by the single winding of the transformer. As a recheck with gaged inductionless bifilarly wound resistances has shown no additional mistakes occur in the measurements with alternating current and industrial frequency according to the here given scheme. The Whearstone bridge used here for direct current had a mistake of  $\pm 0,01$ . The oathode oscillograph EO-7 (vertical amplification 1800, horizontal -35) was used as balancing apparatus. There are 3 figures and 3 Slavic references.

CARD 2/3

An Arrangement for Measuring Electroconductivities at Industrial Current Frequencies without the Use of Platinized Electrodes 76-10-29/34

ASSOCIATION: State University, Dnepropetrovsk (Dnepropetrovskiy gosudarstvennyy universitet).

SUBMITTED: April 12, 1957

AVAILABLE: Library of Congress

CARD 3/3



AUTHOR: Krichmar, S. I.

20-2-37/60

TITLE: Nonstationary Processes at the Anodic Solution of Copper in Orthophosphoric Acid (Nestatsionarnyye protsessy pri anodnom rastvorenii medi v ortofosfornoy kislote)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 2, pp.369-371 (USSR)

ABSTRACT: In investigations of electrochemical polishing, as well as of other electrode processes which are accompanied by a substantial polarization of the concentration, phenomena are encountered the nature of which is directly connected with the formation of a diffusion layer close to the electrode. According to Layner there exists on the potential-time curves at polishing of copper in solutions of orthophosphoric acid a more or less sharply marked jump. The same phenomenon was observed by the author of the present paper at constant voltage in the tub with respect to the curves current intensity - time. It can be seen from the data given that for high concentrations of  $H_3PO_4$  where the naturally convective process

Card 1/3

20-2-37/60

Nonstationary Processes at the Anodic Solution of Copper in Orthophosphoric Acid

of transmission of substance is hampered by the high viscosity of the solution the formula suggested by Sand and Levich is rather acceptable. For concentrations below 6 Mol/l it is useless. On basis of the above, the following interpretation may be given of the appearing maxima of the Volt-Ampere curves: If the recording of the curve takes place relatively fast, then the anode goes into an electrochemical state that corresponds to the maximum current, whereas the layer near the electrode has not yet been formed. Therefore the current intensity still increases for some time of the potential is further increased. This leads to the appearance of the maximum on the curve in the beginning range of the maximum current. Thus the size of the maximum and its shape depend entirely on the duration of the polarization of the anode. There are 3 figures, 1 table, and 5 references, 5 of which are Slavic.

Card 2/3

20-2-37/60

Nonstationary Processes at the Anodic Solution of Copper in Orthophosphoric Acid

ASSOCIATION: Dneprodzerzhinsk Nitrogen Fertilizer Plant  
(Dneprodzerzhinskiy azotno-tukovyy zavod)

PRESENTED: December 14, 1956, by A. N. Frumkin, Member of the Academy

SUBMITTED: September 25, 1956

AVAILABLE: Library of Congress

Card 3/3

AUTHORS: Krichmar, S. I., Kaystra, L. G. SOV/32-24-8-3/43

TITLE: The Radiometric Determination of Potassium in Mineral Fertilizers (Radiometricheskoye opredeleniye kaliya v mineral'nykh udobreniyakh)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 8, pp. 925 - 927 (USSR)

ABSTRACT: A method is described which can be applied to both solutions and dry substances. The current input of the radiometer used was fed into a CH-320 ferro-resonance stabilizer in order to avoid a voltage fluctuation in the system. A simple electromechanical time relay apparatus was used, which substantially reduced the time needed for analysis. A sketch and a description of this apparatus are given. In order to simplify multiple analyses of dry substances a cuvette with removable bottom was devised. It was observed that in investigating dry samples of "Nitrofosk" the velocity of computing with granulated and with pulverized samples was the same, so granulated fertilizers were used. A graph showing the dependence of the number of impulses on the concentration of  $K_2O$  in the Nitrofosk is given, and on this

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The Radiometric Determination of Potassium in  
Mineral Fertilizers

SOV/32-24-8-3/43

graph is also drawn a curve obtained from the method of adding different amounts of calcium chloride. A table of results of similar determinations on potassium using chemical and radiometric methods is also given. There are 3 figures, 2 tables, and 1 reference which is Soviet.

ASSOCIATION: Dneprodzerzhinskiy azotno-tukovyy zavod (Dneprodzerzhinsk Nitrogen-Fertilizer Plant)

Card 2/2

AUTHOR: Krichmar, S. I. 207/76-32-7-12/45

TITLE: On the Problem of the Natural Convection at a Vertical Plate  
(O vzpriam yestestvennoy konvektzii u vertikal'noy plastiny)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 7, pp.1580-1585  
(USSR)

ABSTRACT: V. G. Lovich (Refs 1, 2) investigated this problem already; he obtained, however, wrong results by an inaccurate evaluation. From the direct microscopic investigations in this paper of the part next to the anode may be seen that a tangential rearrangement takes place of the solution in the domain comprising the three- to fourfold thickness of the diffusion layer, the greatest value occurring at the effective boundary surface, whereas it decreases at the anode surface and in the inner part of the solution to 0. Corresponding to these investigations the author derives the equations of motion, and a graphical representation of the function of the change of concentration and of the tangential component of velocity according to the distance from the electrode surface is given. The investigations were carried out in the anodic solution of copper in concentrated solutions of ortho-

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SOV/76-32-7-19/45

On the Problem of the Natural Convection at a Vertical Plate

phosphoric acid and sulfuric acid as colored reaction products render observation easier. The results obtained experimentally and theoretically of the thickness of the diffusion layer are given in a table. The kind of determination of the magnitude of the tangential velocity component at the boundary of the diffusion layer consisted in the fact that the time of passage between the two gauge lines of the eyepiece crossline micrometer, of the fluctuation of the density and of the side particles was measured. The results obtained in the calculation agree well with those from experiments although the conditions of calculation refer to a flat plate and the measurements were carried out at a cylindrical surface. The fact that along the electrode no considerable change of  $\delta$  was found is proved by the calculation results, as the diffusion layer is only little dependent upon the distance from the electrode terminal. There are 2 figures, 2 tables, and 4 references, which are Soviet.

SUBMITTED: March 11, 1957

Card 2/3

807/76-32-7-19/45

On the Problem of the Natural Convection at a Vertical Plate

1. Convection--Theory
2. Electrodes--Thermal effects
3. Solutions--Heat transfer
4. Microscopy

Card 4/3



5(4)

SOV/20-122-3-25/57

AUTHOR: ~~Krichmar, S. I.~~

TITLE: On the Scales of Structure Etching in the Electrochemical Polishing of Metals (O mashtabakh strukturnogo travleniya pri elektrokhimicheskoy polirovke metallov)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 3, pp 424-427 (USSR)

ABSTRACT: In the investigation of the dissolving anode the following phenomena have to be taken into account: There must be a region of supersaturation in the neighborhood of the very small crystal inclusions, and this must cause the increase of the concentration gradient and of the current density in these regions. The electrochemical polishing of metals cannot prevent the decrystallization of crystalline formations the dimensions of which have a noticeable influence on the increase in metal dissolubility. This paper deals with the scale of the etching. The author investigates the simplest case of an anode of pure metal in an electrolyte which does not form passive films in the investigated potential region. First, expressions for the current densities in the various

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SCV/86-122-3-2 /57

On the Scales of Structure Etching in the Electrochemical Polishing of Metals

parts of the anode ( $i_1$ ) and the average (with respect to the whole anode) current density  $i$  are given. If the dissolution takes a sufficiently long time, the current densities of the various parts of the anode become equal. In the majority of the cases of electrochemical polishing, the products of the reaction are dissociated. A formula is deduced for the deviation from the anode plane which defines the scale of the etching. The finite dimensions of the crystals prevent an infinite increase of  $H$  by a corresponding decrease of the effective radius  $r$  of the crystalline inclusion. It is possible, therefore, to use the conception of the maximal dimensions of the crystals the etching of which is not slowed down by inhibiting factors. If the amperage limit is reached in some individual highly electro-positive regions of the surface, the concentration of the reaction products approaches the saturation value. A further increase of the electrochemical potential of these faces is impossible. Under such conditions, the etching is caused by the increased dissolubility of the small crystals. The above-discussed ideas may be applied also to the coating of the surface by a thin passivating layer. A numerical example is given. An increase in temperature and

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SOV/20-122-3-23/57

On the Scales of Structure Etching in the Electrochemical Polishing of Metals

a decrease in thickness of the diffusion layer is favorable for a further suppression of the etching. In the case investigated, the linear dimensions of the etching-figures are so small that their observation by the usual microscopical methods is impossible. Electrochemical polishing may be considered to be a process which prevents the structure etching and which smoothes the irregularities of the microrelief only for the dimensions of from  $10^{-3}$  to  $10^{-5}$  cm. There are 1 figure and 11 references, 11 of which are Soviet.

PRESENTED: May 17, 1958, by A. N. Frumkin, Academician

SUBMITTED: October 15, 1956

Card 3/3

25(6)

AUTHORS:

Krichmar, S. I., Ovcharenko, V. N., Ioffe, A. I. SOV/32-25-2-41/78

TITLE:

Automatic Gas Analyzer for the Determination of Inert Gases  
in Ammonia (Avtomaticheskii gazoanalizator dlya opredeleniya  
inertnykh gazov v ammiake)

PERIODICAL:

Zavodskaya Laboratoriya, 1959, Vol 25, Nr 2,  
pp 213 - 215 (USSR)

ABSTRACT:

The apparatus described (Fig) permits a continuous inspection of the gases used in the production of weak nitric acid. The rate of displacement of a constant volume of an absorption liquid in a eudiometer by the gases remaining after the absorption of ammonia in the absorption liquid is measured. The apparatus has electrically operated valves of the KE-2 type, an automatically balanced bridge EMD-212, and a synchronous motor SD-60 (for turning the timing relays), as well as an EPD potentiometer. The inert-gas content is recorded automatically. A detailed description of the apparatus is contained in the article, and it is mentioned that with the EPD potentiometer it is necessary to correct the delay, which is not true in the case of EPP-09. The total error is given

Card 1/2

Automatic Gas Analyzer for the Determination of Inert Gases SOV/32-25-2-41/76  
in Ammonia

as  $\pm 15\%$ . In experimental operation of the apparatus described the following conditions were obtained: Pressure of ammonia at input - 500-700 mm water column, gas consumption according to the manostat - 1.5 l per hour, duration of analysis - 8 minutes, absorption liquid to be replaced once a week - 3 l of 25%  $H_2SO_4$ , measuring range 0.05-1.5%. A calculation formula as well as a comparative table of the analysis results obtained with this apparatus and the results of chemical analyses are given (Table). There are 1 figure and 1 table.

ASSOCIATION:

Dneprodzerzhinskiy azotno-tukovyy zavod (Dneprodzerzhinsk Nitrogen-Fertilizer Plant)

Card 2/2

5(4)

SOV/20-124-3-36/67

AUTHOR: Krichmar, S. I.

TITLE: On the Polarization Mechanism of the Suppression of Structure Etching in Electrochemical Polishing (O polyarizatsionnom mekhanizme podavleniya strukturnogo travleniya pri elektro-khimicheskoy polirovke)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 621-624 (USSR)

ABSTRACT: The characteristic feature of electrochemical polishing is the suppression of structural etching which, together with polishing, characterized this process completely. Whereas the conditions of polishing are realized in nearly all cases of anodic dissolution, the suppression of etching is characteristic only of electric polishing. Because of the formation of complexes and the stability of oversaturated solutions favorable conditions exist for attaining a considerably higher solubility of the metal up to a complete exhaustion of the activity of the electrolyte. This appears also to be confirmed by the fact that for many cases of electric polishing such a form of volt-ampere is characteristic as has a straight part at the beginning of the range of polishing.

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On the Polarization Mechanism of the Suppression of Structure Etching  
in Electrochemical Polishing

SOV/20-124-3-36/67

which corresponds to a limiting current. The author also investigated the variation of the anode potential and of its individual components as a function of the polarization current. In view of the fact that the theory of concentrated electrolytes is only insufficiently developed, the author confines himself to dealing with the roughly approximated case of the dissolution of a metal in the diluted solution of a strong acid. For the dissociation constant of such a compound a formula is written down. Next, expressions are given for the limiting current and for the potential of the anode. Next, the behavior of two regions of the anode with different normal-potentials  $e_{01}$  and  $e_{02}$  is investigated. The

suppression of etching may in many cases be due to a considerable impoverishment of the electrolyte of the layer near the anode as a result of the formation of oversaturated solutions and complexes. Electric polishing can be realized only at such conditions as enable suppression of etching. The here discussed polarization representations describe only one of the possible mechanisms for the suppression of

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SOV/20-124-3-36/67

On the Polarization Mechanism of the Suppression of Structure Etching  
in Electrochemical Polishing

etching. There are 4 figures and 8 references, 6 of which  
are Soviet.

ASSOCIATION: Dneprodzerzhinskiy azotno-tukovyy zavod  
(Dneprodzerzhinsk Nitrogen-Fertilizer Factory)

PRESENTED: September 2, 1958, by A. N. Frumkin, Academician

SUBMITTED: May 17, 1958

Card 3/3



KRICHEV, S. I., *Sov. Chem. Sci. (Engl.)* - "The theory of electrochemical polishing of copper". Moscow, 1960. 16 pp (*Sov. Chem. Sci. (Engl.)*, 1960, No 14, 1960, 124)

KRICHMAR, S.I.; BEYLINA, L.I.

Use of a thermal conductivity chromatographic analyzer employing  
combustion of the components to  $\text{CO}_2$ . Zav.lab 26 no.10:1171-1172  
'60. (MIRA 13:10)

1. Dneprodzerzhinskiy filial Gosudarstvennogo nauchno-issledovatel'-  
skogo i proyektnogo instituta azotnoy promyshlennosti i produktov  
organicheskogo sinteza.

(Chromatographic analysis)

KRICHMAR, S.I.; OVCHARENKO, V.N.

Apparatus for the continuous automatic control of hydrogen chloride  
in the production of ethylbenzene. Zav.lab 26 no.10:1172-1173 '60.  
(MIRA 13:10)

1. Ural'skiy lesotekhnicheskiy institut.  
(Butyl alcohol) (Ether)

KRICHMAR, S.I.; OVCHARENKO, V.N.

Apparatus for the continuous automatic control of hydrogen chloride  
in the production of ethylbenzene. Zav.lab 26 no.10:1174 '60.

(MIRA 13:10)

(Hydrochloric acid)

(Benzene)

(Chemical apparatus)

5(4)

AUTHORS:

Shapunov, L. A., Krichmar, S. I.,  
Sumbayev, E. G.

S/076/60/034/01/029/044  
B004/B007

TITLE:

A Photoelectric Apparatus for Luminescence Determinations

PERIODICAL:

Zhurnal fizicheskoy khimii, 1960, Vol 34, Nr 1, pp 182 - 183  
(USSR)

ABSTRACT:

A description is given of an apparatus for determining extremely weakly luminescent substances as e.g. organic impurities in mineral acids, salt solutions, etc. The circuit diagram of the apparatus is shown in a figure. It is fed by the alternating current of the mains via an electromagnetic stabilizer of the type SNE-220-0.5. Behind the stabilizer an autotransformer is connected, which reduces the voltage for the mercury-quartz lamp of the type PRK-4 to 100 v. A neon lamp of the type MN-5 flashes up if the mercury quartz lamp with the optimum operational conditions selected (50 v, 2.2 a) burns, thus indicates that the apparatus is ready for use. The light of the PRK-4-type lamp falls through a light filter and a stop on to the sample and excites luminescence. Luminescence radiation then passes through a liquid filter

Card 1/2

A Photoelectric Apparatus for Luminescence  
Determinations

S/076/60/034/01/029/044  
B004/B007

with a concentrated  $\text{NaNO}_2$  solution and hits the photo cathode of the FEU-19M-type photomultiplier. The photoelectric current is conveyed via a compensating resistance and a direct-current amplifier to the galvanometer. Under the conditions selected the characteristics of the photomultiplier and of the direct-current amplifier are linear, so that the reading of the galvanometer is proportional to luminescence intensity. The application of this apparatus for luminescence analyses in the nitrogen industry considerably increased the precision of investigations which have hitherto been carried out visually. There are 1 figure and 3 Soviet references.

ASSOCIATION: Dneprodzerzhinskiy azotno-tukovyy zavod (Dneprodzerzhinsk Nitrogen Fertilizer Factory)

SUBMITTED: April 21, 1958

Card 2/2

18.7300

S/076/60/034/06/02/040  
B015/E001

AUTHOR: Krichmar, S. I. (Dneprodzerzhinsk)  
TITLE: The Theory of the Anodic Sharpening of Instruments  
PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 6,  
pp. 1161-1168

TEXT: Questions of the anodic dissolving of thin metal wires, knife blades and needles were discussed with a view to sharpening. It was established on the basis of theoretical tests that electrochemical polishing of thicker wires for the preparation of very thin metal threads was impossible. This was confirmed experimentally by the electrolytic dissolution of an 0.08 mm thick copper wire in 10 M  $H_3PO_4$  in a corresponding apparatus (Fig. 1) (Table 1, comparison of the experimental or calculated values). Tests on the anodic dissolution of cutting surfaces and needles lead to equations on the ratio between the cutting edge angle and the radius of the rounding of the cutting edge which can be reached by anodic dissolution. The equations obtained were tested experimentally

Card 1/2

81563

The Theory of the Anodic Sharpening  
of Instruments

S/076/60/034/06/02/040  
B015/B061

on 5-γ (5-U) instrument steel and electrolyte copper, and the calculated values were compared with those obtained in the experiment (Tables 2,3). The data given show that under certain geometric conditions (angle of the cutting edge, initial radius of the rounding of the cutting edge, size of the diffusion layer, concentration etc.), the diffusion of the solution products is such that electrochemical polishing can lead to sharpening of the cutting edge or the pointing of an instrument. There are 5 figures, 3 tables, and 5 Soviet references. X

ASSOCIATION: Azotno-tukovyy zavod Dneprodzerzhinsk (Dneprodzerzhinsk  
Works for Nitrogen Fertilizers)

SUBMITTED: February 12, 1958

Card 2/2



S/076/61/035/003/002/015  
B101/B110

AUTHOR: Krichmar, S. I.

TITLE: Elimination of etch pits by electrochemical polishing of metals

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 9, 1961, 1918 - 1920

TEXT: The author had published some data on the elimination of etch pits by electrochemical polishing in an earlier paper (Zh. fiz. khimii, 30, 577, 1956). Here, he gives some additional data obtained on the basis of microphotographs taken with an MMM-2 (MIM-2) metal microscope, magnification 140 - 1350 fold [Abstracter's note: Microphotographs not reproducible]. (1) The behavior of copper etched with 10%  $\text{HNO}_3$  in 7.5 M  $\text{H}_3\text{PO}_4$  showed that the intensity of etching was lowest with a limit current ( $i_0 = 0.0040 \text{ a/cm}^2$ ) and with  $i = 0$ , and highest with  $i \approx 0.5i_0$ . ✓

Since the rate of etching depends on the difference  $\Delta i$  of the current density in different places of the sample, and on the potential difference  $\Delta \varphi$ , the result is explained by stating that  $d\varphi/di$  has a maximum around

Card 1/2

Elimination of etch pits...

S/076/61/035/009/002/015  
B101/B110

$1 \approx 0.5i_0$ . (2) Polishing of  $\alpha\beta$  brass in 10 M  $H_3PO_4$  showed that, due to the two-phase structure of this alloy, the etch pits produced by 10%  $HNO_3$  could not be fully eliminated by electrochemical polishing. (3) The etch pits could not be fully eliminated even after 30 min when carbon steel was electrochemically polished in an electrolyte consisting of 82%  $H_3PO_4$  (specific gravity 1.6), 12.6%  $H_2SO_4$  (specific gravity 1.84), and 6%  $CrO_3$  at 70°C, and with an anode potential of 5 v. (4) The etch pits were completely removed from stainless steel type 304 (EYa1T) etched with 20%  $HNO_3$  by electrochemical polishing with the same electrolyte as under (3) with an anode potential of 3 v measured with  $LLPU-1$  (LLPU-1) cathode voltmeter (potential referred to saturated calomel electrode). (5) Polishing of aluminum etched in 10%  $Na_2CO_3$  solution by an electrolyte of the composition 60%  $H_3PO_4$ , 10%  $H_2SO_4$ , 5%  $CrO_3$ , 25%  $H_2O$  at 50°C, and an anode potential of 3 v, did not completely remove the etch pits. Thus, homogeneous surfaces were only obtained with copper and stainless steel by electrochemical polishing. There are 3 figures and 2 Soviet references.

SUBMITTED: December 20, 1958

Card 2/3

KROCHMAN, S.I.

Effect of surface-active substances on the probability of formation of a two-dimensional nucleus during electrocrystallization. Zhur. fiz. khim. 36 no.3:663-664, M. '62.

(MIRA 17:8)

1. Snoprodzerzhinskiy filial Gosudarstvennogo instituta  
azotnoy promyshlennosti.

KRICHMAR, S.I.

Change of surface microgeometry in the anodic solution of metals.  
Dokl.AN SSSR 144 no.4:833-835 Jo '62. (MIRA 15:5)

1. Dneprodzerzhinskiy filial Nauchno-issledovatel'skogo instituta  
azotnoy promyshlennosti. Predstavleno akademikom A.N.Frumkinym.  
(Electrolytic polishing)

PINSKER, A.Ye., kand. tekhn. nauk; KRICHMAR, S.I., kand. khim. nauk

Heterogeneous dealkylation of polyethylbenzenes over  
aluminosilicates. Khim. prom. no.4:255-258 Ap '63.  
(MIRA 16:8)

KRICHMAR, S.I.; GRUBA, A.I.; DIFONZO, J.L.

Chromatographic method for determining the acetylene content  
of gases of nitrogen fertilizer plants. Khim. prom. no. 10:  
754-756 O '63. (MIRA 17:6)

GALUSHKO, V.P.; KOVTUN, V.N.; KRICHMAR, S.I.

Study of the anolyte layer by microscopy. Ukr. khim. zhur.  
29 no.7:764-770 '63. (MIRA 16:8)

1. Dnepropetrovskiy gosudarstvennyy universitet.  
(Electroplating) (Electrodes) (Microscopy)

KRICHMAR, S.I.

Interrelation between the characteristics of polarization curves and the suppression of structural etching during electrolytic polishing. Zhur. prikl. khim. 36 no.9:1946-1950 D '63.  
(MIRA 17:1)



S/076/63/037/002/002/018  
B101/B186

AUTHOR:

Krichmar, S. I. (Dneprodzerzhinsk)

TITLE:

Mechanism of anodic dissolution in the electrolytic polishing of metals

PERIODICAL:

Zhurnal fizicheskoy khimii, v. 37, no. 2, 1963, 265-271

TEXT: Based on universally applicable thermodynamic and diffusion rules, it is shown that the smoothening of micro-relief on an ideally homogeneous surface can be explained by thermodynamic and diffusion processes which are more intensive at the protuberances of the surface. In electrolytic polishing, however, the smoothening of structural inhomogeneities is less important than the removal of traces left by the mechanical processing, due to thermodynamic and diffusion processes. This inhibition of the etching takes place mainly at the limit current,  $i_1/i_0 \rightarrow 0$ .

$H_{etch} = (\epsilon_{cryst}/\delta/4i)(i_1/i_0) + \sqrt{[(\epsilon_{cryst}/\delta/4i)(i_1/i_0)]^2 + (\gamma\delta/zF_0i)(i_1/i_0)}$   
(18) is derived for the residual roughness  $H_{etch}$  of the polished surface of

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Mechanism of anodic dissolution ...

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a one-phase metal.  $\bar{\epsilon}_{\text{cryst}}$  is the potential difference due to the crystalline nature (crystallization defects, etc.),  $\delta$  is the thickness of the diffusion layer,  $\gamma$  is the surface tension at the interface of the two phases,  $M$  is the molecular weight,  $\rho$  the density of the solid substance and  $z$  the valency of the metal ions. When  $\bar{\epsilon}_{\text{cryst}}$  is large, Eq. (18) becomes:

$$H_{\text{etch}} = (\bar{\epsilon}_{\text{cryst}} \delta / 2i)(oi/oq); \text{ when } \bar{\epsilon}_{\text{cryst}} \text{ is small,}$$

$H_{\text{etch}} \approx \sqrt{(\gamma \delta / zF)(oi/oq)}$ . In multiphase alloys the condition  $oi/oq \rightarrow 0$  is accompanied by the condition of equal linear dissolution rate of all phases. The anodic polarization in electrolytic polishing was studied experimentally by determining the polarization curve of copper in 7.5 M  $\text{H}_3\text{PO}_4$ . Results:  $\psi = b + (RT/xzF) \ln[i/(i_0 - 1)^{y/2}]$ , where

$$b = \psi_0 + (RT/xzF) \ln[K_1 x^{y/2+1} \cdot (zFD/\delta)^{y/2-1} / (K_2 y)^{y/2}]; i_0 \approx zFDyc_0/x\delta; x \text{ and } y \text{ are the atomic parts of the compound } \text{Me}_x\text{A}_y \text{ forming in the dissolution of Cu; } K_1 = c_{\text{M}^+}^x \cdot c_{\text{A}^-}^y / c_{\text{C}} \text{ is the dissociation constant of } \text{Me}_x\text{A}_y; c_{\text{M}^+}, c_{\text{A}^-},$$

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$c_c$  are the concentrations of the Cu ions, the acid anions and of the reaction product, respectively;  $K_2 \approx c_{H^+} \cdot c_{A^-} / c_{ac}$  is the dissociation constant of the acid,  $c_{ac}$  being the concentration of the free acid;  $D$  is the coefficient of diffusion,  $c_0$  is the initial concentration of the acid. The polarization curve has the shape of a polarographic curve with an inflection point at  $i_{infl} = i_0(1 - \sqrt{0.5y})^{-1}$ . There are 4 figures. ✓

ASSOCIATION:

Dneprodzerzhinskiy filial instituta azotnoy promyshlennosti (Dneprodzerzhinsk Branch of the Institute of the Nitrogen Industry)

SUBMITTED:

December 20, 1958

Card 3/3

KRICHMAR, S.I.

Effect of the general and local curvature of the surface of a metal in the process of its chemical dissolution. Zhur. fiz. khim. 37 no.5:1148-1150 My '63. (MIRA 17:1)

1. Gosudarstvennyy institut azotnoy promyshlennosti i produktov organicheskogo sinteza, Dneprodzerzhinskiy filial..

KRICHMAR, S.I.

Smoothing mechanism in electrochemical polishing (quantitative concepts). Zhur. fiz. khim. 37 no.11:2397, 2403 N°63.

(MIRA 17:2)

1. Dneprodzerzhinskiy filial Gosudarstvennogo nauchno-issledovatel'skogo i proyektnogo instituta anodnykh promyashlennosti i produktov organicheskogo sinteza.

L 14350-63

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EWT(1)/EWP(q)/EWT(m)/EKO(b)-2/ES(w)-2/BDS AFFTC/ASD/  
JD/IJP(C)/WB

ACCESSION NR: AP3003859

S/0020/63/151/003/0616/0619

AUTHOR: Krichmar, S. I.

71  
70

TITLE: Growth of filament crystals on cathodes

SOURCE: AN SSSR. Doklady\*, v. 151, no. 3, 1963, 616-619

TOPIC TAGS: crystal, filament, cathode, surfactant

ABSTRACT: Price et al (Acta Metallurgica, 6, 1958, 524) proposed that the density of current toward the face of a growing filament crystal of silver has the following dependence:

$$i \sim (C_e/R)^{1/3}$$

where  $C_e$  is the concentration of surfactant and R is the radius of the crystal. The expression proved to be incorrect for high values of R and this was interpreted as a result of oversimplification of the mechanism of crystal growth in an electrolyte containing surface-active components. Therefore, the procedure

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ACCESSION NR: AP3003859

of process evaluation has been reexamined. It was assumed that possibly the formation of a two-dimensional crystal nucleus is associated with a surface concentration of impurities by the expression previously reported by the author (Zh. F. Kh., 34, 1962, 663) and that the formation of a new layer is always started with the formation of a new crystal nucleus. From this consideration, the relation between current with and without impurities has been worked out. Further, the effect of the concentrations of metallic ions and impurities on diffusion of both components as well as a revised rate of deposition of impurities have been taken into consideration. Incorporation of all these considerations resulted in a new expression which indicates that preferable deposition of a metal on the cathode depends on presence of unoccupied space and size of crystal nucleus. Since both factors depend on the density of current, results obtained by Price and author at high density are close, but, at a low current density, the author's expression is more accurate. Orig. art. has: 17 equations and 1 table.

ASSOCIATION: Dneprodzerzhinsk Branch of the State Institute for the Nitrogen Ind.

Card 2/32

KRICHMAR, S.I.

Approximate calculation of the levelling effect in the  
electrochemical deposition of a metal. Dokl. AN SSSR 153  
no.5:1111-1114 D '63. (MIRA 17:1)

1. Dneprodzerzhinskiy filial Gosudarstvennogo instituta  
azotnitsy promyshlennosti. Predstavleno akademikom A.N.  
Frumkinym.



ACCESSION NR: AP4047124

S/0080/64/037/010/2244/2249

AUTHOR: Krichmar, S. I.

TITLE: Study of the change of the metal surface microgeometry of micromodels upon anodic solution

SOURCE: Zhurnal prikladnoy khimii, v. 37, no. 10, 1964, 2244-2249

TOPIC TAGS: electrochemical polishing, electropolishing, etching, anodic dissolution, metal surface leveling

ABSTRACT: A study of the solution of the profile of copper and stainless steel micromodels in sulfuric and phosphoric acid solutions under conditions approaching those taking place when roughness is removed from metal surfaces was conducted to find an explanation of the principles of the leveling of metal surfaces in anodic processes and in electrochemical polishing. In all cases the leveling of the profile was characterized by a semi-logarithmic relationship between the change in the height of the irregularity and the electrolysis time:

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ACCESSION NR: AP4047124

$$\tau = \frac{\rho n F b}{M k} \ln \frac{H_0}{H}.$$

where  $\rho, n, M$  = specific weight, molecular weight and valency of the metal dissolved,  $F$  = Faraday number,  $k$  = current yield,  $H_0$  = initial height of the irregularity at the time when stationary conditions are established, and  $H$  = height at time  $\tau$ . It was shown experimentally that leveling is not a property inherent only to the process of electropolishing, but that electropolishing is primarily associated with the realization of conditions for suppressing structural etching. Orig. art. has: 4 figures and 1 table

ASSOCIATION: None

SUBMITTED: 04Nov62

ENCL: 00

SUB CODE: MM

NO REF SOV: 005

OTHER: 000

Card 2/2

KRICHMAR, S.I.

Potentiostat with automatic linear programming of potential with time, Zhur. fiz. khim. 38 no.1:239-240 Ja'64. (MIRA 17:2)

1. Gosudarstvennyy institut azotnoy promyshlennosti i produktov organicheskogo sinteza, Dneprodzerzhinskiy filial.

**"APPROVED FOR RELEASE: Monday, July 31, 2000**

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1. The first part of the document is a list of the names of the individuals who were involved in the project. The names are listed in alphabetical order. The names are: [illegible]

**APPROVED FOR RELEASE: Monday, July 31, 2000**

**CIA-RDP86-00513R000826430**

ORIGINAL 11.

Negative leveling effect in the deposition of a layer from a  
silver iodide electrolyte. Elektrikodina 1 no. 5:609-612  
My '65. (MERA 18:6)

I. Gerasimovskiy/ Institut azotnoy promyshlennosti, Dnepro-  
dzerzhinskii filial.

KRICHEV, S.I.

Mechanism of a leveling effect in the cathodic deposition of nickel.  
Zhur. fiz. khim. 39 no.3:602-604 Mr '65. (MIRA 18:7)

1. Gosudarstvennyy institut azotnoy promyshlennosti, Dneprodzerzhinskiy  
filial.

KNIGHMAR, S.Y.; PONOMSKAYA, A.Ya.

Mechanism of the leveling effect in the cathodic deposition of nickel from coumarin-containing electrolytes. Zhur. fiz. khim. 39 no.3:741-744. Mar '65. (MIRA 18:7)

1. Dneprodzerzhinskii filial Gosudarstvennogo nauchno-issledovatel'skogo i proyektirovogo instituta azotnykh promyshlennosti i produktov organicheskogo sinteza.

KRICHMAR, S.I.,; STEPANENKO, V.Ye.

Determination of impurities in commercial products of ethylbenzene.  
Khim. prom. 41 no.3:181-183 Mr '65. (MIRA 18:7)



KRICHMAR, S.I.; AFENDIK, K.F.

Nature of polarization in the anodic dissolution of copper in concentrated solutions of  $H_3PO_4$ . Dokl. AN SSSR 159 no.2:405-408 N '64. (MIRA 17:12)

1. Dneprodzerzhinskiy filial Gosudarstvennogo nauchno-issledovatel'skogo i proyektnogo instituta azotnoy promyshlennosti i produktov organicheskogo sinteza. Predstavleno akademikom A.N. Frumkinym.

ZRICHMAR, S.I.

Diffusion kinetics and the mechanism of levelling of  
surface microroughness in anodic copper dissolution.  
Part 4. Zhur.fiz.khim. 39 no.11:2779-2785 N '65.

(MIRA 18:12)

1. Dneprodzerzhinskiy filial Gosudarstvennogo instituta  
azotnoy promyshlennosti.

KRICHMAR, S.I.

Theory of the levelling effect in the electrochemical behavior  
of metals. Elektrokimiia 1 no.7:858-861 J1 '65.

(MIRA 18:10)

1. Gosudarstvennyy institut azotnoy promyshlennosti, Dnepro-  
dzerzhinskiy filial.

NEICHMAN, S.I.

Diffusion kinetics and the mechanism of smoothing the micro-roughness of surfaces in anodic copper dissolution. Part 1.  
Zhur. fiz. khim. 39 no.4:817-822 Ap '65. (MIRA 19:1)

1. Gosudarstvennyy institut azotnoy promyshlennosti, Dneprodzerzhinskiy filial. Submitted April 5, 1963.

KRICHMAR, S.I.; PRONSKAYA, A.Ya.

Diffusion kinetics and mechanism of leveling of roughnesses;  
during anodic dissolution of copper. Report 2. Zhur. fiz.  
khim. 39 no.6:1373-1379 Je '65. (XJPA 18:11)

1. Gosudarstvennyy institut azotnoy promyshlennosti,  
Dneprodzerzhinskiy filial. Submitted April 1, 1965.

KRICHMAR, S.I.; PRONSKAYA, A.Ya.

Leveling effect in electrochemical polishing of metals. Elektro-  
khimiya 2 no.1:69-73 Ja '66. (MIRA 19:1)

1. Gosudarstvennyy institut azotnoy promyshlennosti, Dneprodzer-  
zhinskiy filial. Submitted December 26, 1964.

KRICHMAR, S.I.

Diffusion kinetics and mechanism of leveling of surface micro-roughness during the anodic dissolution of copper. Part 3. Zhur. fiz.khim. 39 no.7:1783-1786 JI '65.

1. Gosudarstvennyy inst'tut azotnoy promyshlennosti,  
Dneprodzerzhinskiy filial.

(MIRA 19:8)

Reel # 264

Krementulo, Yu.V.  
to

KRICHMAR, S.I.



Σnd